Apple II Hardware: Character Generator ROM

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Security: Everyone

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To allow you to write programs involving special characters or lower case characters, you can get a 2716 PROM to replace the the character generator ROM in revision 7 and later Apples. This note describes how the characters are mapped in the ROM.

Characters storage uses a scheme of eight bytes per character, arranged in the ROM in the order shown in Table 7 on page 15 of the Apple II Reference Manual. The starting address for each character is the address from Table 7 multiplied by eight. Lower case characters, if desired, should be mapped in place of the numbers and punctuation in columns $E0 and $F0.

Each character is made up of eight bytes. Each byte represents one row of dots. The most significant bit of each byte is ignored by the hardware. The lowest-addressed byte of each character is the topmost row of dots of the displayed character. The first and last bits of each row of dots are usually set to zero to supply a two dot space between characters. The bottom row of dots is usually left set to zero to allow a one row space between lines. Some lower case character sets use the bottom row for descenders (the letter "g", for example). This causes overlap when the descender is directly above an upper case letter like "B". The following diagram shows how the characters are built. The three digit hexadecimal number is the hexadecimal ROM address for each byte and the two digit hexadecimal number is the pattern of on and off bits.

```
$208  $08  ...*...    $708  $00  .......    $730  $08  ...*...
$209  $14  ..*.*..    $709  $00  .......    $731  $14  ..*.*..
$20A  $22  .*...*.    $70A  $1C  ..***..    $732  $10  ..*....
$20B  $22  .*   *.    $70B  $02  .....*.    $733  $10  ..*....
$20C  $3E  .*****.    $70C  $1E  ..****.    $734  $3E  .*****.
$20D  $22  .*...*.    $70D  $22  .*...*.    $735  $10  ..*....
$20E  $22  .*...*.    $70E  $1E  ..****.    $736  $10  ..*....
$20F  $00  .......    $70F  $00  .......    $737  $00  .......
$210  $3C  .****..    $710  $20  .*.....    $738  $00  .......
$211  $22  .*...*.    $711  $20  .*.....    $739  $00  .......
$212  $22  .*...*.    $712  $3C  .****..    $73A  $1C  ..***..
$213  $3C  .****..    $713  $22  .*...*.    $73B  $22  .*...*.
```

```
$214  $22  .*...*.    $714  $22  .*...*.    $73C  $22  .*...*.
$215  $22  .*...*.    $715  $22  .*...*.    $73D  $1E  ..****.
$216  $3C  .****..    $716  $3C  .****..    $73E  $02  .....*.
$217  $00  .......    $717  $00  .......    $73F  $1C  ..***..
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